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International Portfolio Allocation and Income Smoothing: Evidence from Recent Changes in Euro Region. *

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Abstract

In this paper, we make two contributions to the literature. First, we construct a new measurement to capture income smoothing effectively. Second, we present new empirical evidence on the linkages between international asset trading and income smoothing. We use factor income inflows instead of the commonly used net factor income and arrive at results, among others, similar to previous studies in the literature: (a) risk sharing and equity portfolio home bias are strongly correlated for EU members; and (b) Specialization in output plays a significant role in income smoothing. Our findings also confirm that the increased level of economic integration witnessed in the Euro area as a result of the monetary union fosters output specialization across EU members and leads to asymmetric output fluctuations. Cross-border financial assets' trading within the Euro Area, though smaller in comparison to the overall OECD block, serves as a shock absorber as factor income flows to smooth domestic consumption and income. However, although we have observed a decrease in home bias for OECD members, we could not find any evidence of higher income smoothing as a result.

JEL classification: F36, F155, F41, G11, G12
Keywords: Capital Market Integration, Euro Portfolio Bias, Income Smoothing.

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1 Introduction

Macroeconomic models are built on the central assumption that economic agents are either rational or near-rational. That is, at the time of making optimal decisions for themselves, individuals determine whether to use all or part of the available information (Akerlof, Dickens, and Perry, 2000). Investments in capital markets, nationally or internationally, are driven by those same principles, suggesting that investors' portfolio allocation is a by-product of not only current news but also on expectations when seeking higher returns in different markets. Grubel (1968) explains investors' rationale for holding internationally diversified portfolio by looking at the mean-variance of both portfolios with purely domestic assets and portfolios with a combination of domestic and foreign assets. He shows that the mean-variance of the latter is smaller than the former. Lewis (1999) substantiates Grubel's main findings by providing both theoretical foundation and empirical evidence. However, Poterba (1991) and Tesar and Werner (1995) have observed that the investors do not hold foreign financial assets as much as they should optimally. A large portion of their financial assets are from the domestic market, a behavior that is known as "home bias".[1]

Over the last two decades, capital market integration has grown tremendously leading to higher volumes of international assets trading among countries. This has led to a downward trend in home bias levels, in particular recorded among high-income Organization for Economic Co-operation and Development(OECD) members, in spite of the fact that these countries have failed to reach the optimum level suggested by the Capital Asset Pricing Model (CAPM). Adam et al. (2002) interpret the recent decrease in equity and bond home bias as an evidence of further integration in the Euro area.[2] Their study have noted that the share of cross-border equity among domestic investors that was relatively steady prior to the materialization of the European monetary union (EMU) has since then recorded a considerable increase. In a similar study, Baele et al. (2004), provided evidence on the substantial decrease in home bias across

[1]This finding also confirms earlier evidence by Grauer and Hakansson (1987) documented that despite significant gains to be made from international diversification (both in terms of reduced risk and increased returns), investors were sticking to domestic equity.

[2]Similarly, Adjaout et al. (2002), in a detailed study, confirms evidence of Adam et al. (2002), that higher economic integration in euro area leads higher volume of international asset trading across the borders.

euro region. Since the start of the monetary union, the share of European-wide bond funds has increased dramatically, indicating a reduction in the home bias of bond portfolios (both government and corporate bonds) in the Euro area, Baele et al. (2004) granted.[3] Recently, Foad (2007) documented home bias levels of OECD members have decreased lately and they are certainly below 1990s levels however, still fall short of the optimal levels predicted by the international CAPM model.

The welfare loss associated with investors preferences for purely domestic portfolio depends on the opportunity cost of portfolio home bias. One way to gauge the potential gains from international diversification is through mean-variance analysis, a very well known method, that allows us to examine the both the risk and return on international portfolios, comparing a purely domestic portfolio. However, considering the aggregate welfare of nations, the literature is relatively new and still developing. First, Sørensen and Yosha(1998) applied a new panel data model for OECD countries to decompose the channels of income and consumption smoothing. Even though capital market integration is very limited in early 1990s across the OECD members, they foresee the possibility of the connection between the international income smoothing and cross border asset trading. In a recent study, mainly the extension of Sørensen and Yosha (1998), Balli and Sørensen (2007) find that the increased level of capital market integration,-higher levels of international asset trading among euro members-created potentials for a higher percentage of income smoothing in the euro area. A more detailed study of Sørensen, Wu, Yosha, and Zhu (2007), purely deliberating on international income smoothing, has documented that there is a strong correlation between the increase in the volume of cross-border assets trading and the level of income smoothing. This finding supports previous views that the more internationally diversified an investor's portfolio is the higher the possibility to smooth income as they are able to switch income from the foreign markets to the domestic market to keep their levels of consumption relatively stable over time at home.

Our contribution to the literature comes at this point. First, we improve upon the existing methodology, by suggesting a new approach to the measurement of income smoothing via international asset holding. In detail we propose an alternative approach of measuring

[3]Maela (2008) also confirms the previous studies regarding the decline in home bias for euro area. His study indicates that euro members investors experienced a recent shift from equity home bias to equity Euro bias.

income smoothing via cross-border asset holdings that focuses on factor income inflows as opposed to the commonly used net factor income in the literature mainly proposed by Sørensen et al. (2007). A compelling reason for purely concentrating on factor income inflows is that during recession periods wages, interest, and profits tend to be lower and this may entail a reduction in outflows, consequently an overestimation of net foreign factor income and its impact on income and consumption smoothing. Using net factor income in our views carries the potential drawback of producing higher(lower) smoothing than normal during recession (expansion). The factor income inflow by contrast does not suffer from this shortcoming. Its movement or magnitude does not necessarily synchronize with fluctuations in domestic output, and in some cases it might even dis-smooth consumption.[4] Second, we present empirical evidence that higher income smoothing via capital markets is associated with certain characteristics of the countries. we can address those characteristics as the higher level of economic integration of the selected country across its integrated region, in particular the currency region, and as a further step of that economic integration, the specialization in production. Using data from various sources and panel regression techniques for the period 1970–2006, we observe that higher level of economic integration among Euro countries has altered the structure of financial assets trading in these countries and as a result higher level of income smoothing takes place. In other words, financial market barriers that once existed across major parts of Europe have been removed with the materialization of the European Union giving investors more stimuli to invest domestically. These investors allocate a larger portion of their financial assets portfolio holding within the monetary union, named as euro portfolio bias.[5] More importantly we further documented that international asset holdings along with specialization in output play significant role in the higher level of income smoothing that the Euro members have experienced lately. We concur with Kalemli-Ozcan, Sørensen and Yosha (2001, 2003) that economic integration enhances specialization in output production and creates asymmet-

[4] A more likely scenario is one where a country has a large net debt position and the world interest rate falls, leading to lower debt payments. Accordingly, if the creditor countries happen to grow faster during such period than debtor countries, debt holdings could contribute negatively to the measurement of income smoothing.

[5] Lane (2005) first introduced the concept of euro portfolio bias, later Balli (2007) and Maela (2008) provide further evidence for euro portfolio bias. They documented the recent decline in home bias across in euro area is associated with euro portfolio bias.

ric output shocks across the Euro area. Indeed, asymmetric output shocks generate some opportunity for income risk sharing when the domestic Euro investors allocate their portfolios within the Euro region. However, we could not observe that level of income smoothing for the rest of the OECD member countries notwithstanding the fact that these countries have recorded higher volume of international assets trading. There is a good raison d'tre to argue that there is statistically significant relationship between the volume of international assets trading and income smoothing for these countries.

The rest of the paper is organized as follows. Section 2 is a background of the relationship between home biasness, income smoothing, output specialization and risk sharing. Section 3 presents the methodology. Section 4 describes and analyzes the data. Section 5 discusses the empirical results and Section 6 concludes the paper.

2 Background of Risk Sharing

Income smoothing (risk sharing) between countries can increase welfare. For the countries in a currency union risk sharing may be particularly important for the functioning of the union since central monetary policies are unable to address "asymmetric" shocks. It is the case that when one country is experiencing boom and the other is in recession, investors with diversified portfolio of both countries' assets are able to mitigate pressure on consumption by transferring income from the former to the latter.

Theoretically, perfect risk sharing(income smoothing) exists when real consumption growth is totally independent of real output growth across countries. Risk sharing can occur via a number of channels, including cross border ownership of financial assets, lending and borrowing on credit markets, subsidies, and social expenditures. [6] The last two schemes are compensation mechanisms that do not really exist across countries but rather within countries. In this paper, we merely focus on cross-border ownership of financial assets that smoothes income by making

[6]Sørensen and Yosha and Balli and Sorensen(2007) have documented the effectiveness of channels of risk sharing among OECD members. At the federal level, it is first observed that income smoothing takes place via fiscal transfers. Sala-i-Martin and Sachs (1992) are among the first to show that the U.S. has been a successful monetary union partly due to the fact that fiscal federalism has been effective in offsetting the effects of asymmetric shocks across U.S. states. Later, Asdurabali et al.(1995) explored the channels of risk sharing across U.S. states

income growth in a country less sensitive to output growth of that country, which we refer to as the factor income channel.

The literature on the effects of foreign assets holding on domestic economies is quite sparse despite the enormous increase in international assets trading witnessed in the last decade that emerges with the globalization of markets. Developed countries have expanded their net and, to a larger extent, their gross holdings of foreign assets substantially. Lately, income flows from foreign assets have reached considerable levels that can buffer shocks to domestic income (see Lane and Milesi-Ferretti (2006)). Foreign asset returns can originate from two sources: (1) productive activities and (2) revaluation of existing assets due to exchange rate fluctuations. We are, however, interested in the smoothing via factor income in this paper.[7]

More precisely, the literature suggests that investors who diversify their portfolio enjoy the risk sharing via their holding of international assets. Therefore, foreign assets' holding is equivalent to an insurance against economic downturns at home. To the extent that the mix of assets obeys CAPM, we should observe a lower variance in the prices of these assets, hence a less risky portfolio. At the macro level, international income smoothing takes place and buffers domestic shocks via factor income flows from abroad. It is customary in the literature to use the difference between gross domestic product (GDP) and gross national product (GNP) as a proxy of the amount of net income flows across countries to gauge the extent of risk sharing across countries. That is:

$GNP \approx GDP + R_d * A_d - R_f * A_f$,

where A_f is the stock of domestic assets owned by foreign residents, R_f is the rate of return on these assets, and A_d and R_d are the stock of and the return on domestically-owned foreign assets, respectively.[8] As can be understood, countries may end up with higher level of income smoothing if they have higher level of foreign asset holdings. What seems to be

[7]Lane and Milesi-Ferretti (2005) point out that asset valuation effects can play a significant role in the process of adjustment of international imbalances-in particular, the large net debt position of the United States has been reduced significantly through valuation effects since the beginning of the new millennium. Balli and Sørensen (2007) examine if capital gains have played a major role in international income and consumption smoothing, and find significant results for the OECD economies.

[8]In fact this is only an approximate relationship between the Gross Domestic Product and Gross National Product. However, we neglect the remittances transfer which is also considered in the Gross National Product calculation. We provide the related intuition later sections of the text.For detailed equation you may check the U.N. Statistics Database.

missing in the literature, however, is to account for the fact that some portion of the income inflows or outflows does not come from asset holdings but rather from remittances, private transfer payments, wages and salaries earned by aliens in either country. Our study is of interest because there is no evidence thus far that net factor income flows as a result of activities other than foreign asset holdings is zero or negligible for developed nations, let alone emerging markets such as Turkey, Mexico, China, and Indonesia, to cite just a few. Isolating income outflows is equivalent to disregarding remittances, private transfer payments, wages and salaries earned by aliens in a given country. By doing so, we are able to (a) capture the impact of foreign asset holdings to risk sharing among countries; (b) test the robustness of previous findings; and (c) enhance our understanding of the linkages between income smoothing and output specialization.

3 Methodology

The literature on income smoothing has shown that people can insure their income against country-specific output risks by holding an internationally diversified portfolio. At the aggregate level, holding foreign financial assets creates net factor income flows that partially insulate the idiosyncratic fluctuations in GDP. Sørensen and Yosha (1998) and Balli and Sørensen (2007) applied the following regression to measure the level of factor income smoothing for European countries:

$$\Delta \log \text{GDP}_t^i - \Delta \log \text{GNP}_t^i = \nu_{f,t} + \beta_f \ \Delta \log \text{GDP}_t^i + \epsilon_{i,t} \ , \tag{1}$$

where $\Delta \log \text{GDP}$ is the annual change in GDP per capita in constant prices[9] and $\Delta \log \text{GNP}$ is the annual change in GNP per capita in constant prices. When coefficient of β_f is the coefficient estimate that captures income smoothing from net factor income flows, $\nu_{f,t}$ and $\epsilon_{i,t}$ are fixed effect and error terms, respectively. A positive value of β_f implies that net factor income from abroad is not perfectly correlated with idiosyncratic output shocks; thereby offering some risk sharing(income smoothing) for the domestic output shocks. As β_f approaches 1, in aggregate

[9] 2000 is counted as the base year.

level, the country under consideration experiences greater income smoothing from cross border asset holdings. We extend this methodology by decomposing the factor income inflows to take into consideration the relationship between income smoothing and foreign asset trading.

Extensively, in this paper, we go one step further and decompose the factor inflows, considering that income smoothing and foreign asset trading relationship is best captured by the gdp+factor income inflows, instead of using net factor income. Since in the previous models, it has been assumed that the outflows will have same effects on the risk sharing and it should be negligible.[10] In the case of economy is booming and paying higher dividends, the amount of the factor income inflows will be severely understated with the dividend payments and remittence's transfers. In a clear example, the country X is allocating a Hugh amount of its portfolio across its borders, thereby enjoying a high volume of income flows from those securities. However, if net income flows consist almost solely dividend, interest, and other earnings accruing to capital, income of, say, X *resident* working in UK is also part of factor income. Our sample also considers the high income OECD members where the residents of these nations are working mostly inside their borders, on the other hand there exists a considerable amount of non-resident aliens working inside of the border of these countries, and transferring some amount of their income to abroad, which is considered as factor income outflow. If we consider the factor income outflows this amount will also captures remittence' income that is transferred to abroad, which is the not the factor income outflows due to the asset holdings. Therefore, in order to consider the effect of the portfolio incomes, we only take into account the factor income inflows.

Our model can be written as follows;

$$\Delta \log \text{GDPin}_t^i - \Delta \log \text{GDP}_t^i = \nu_{f,t} + \beta_{f+} \ \Delta \log \text{GDP}_t^i + \epsilon_{i,t} \ , \tag{2}$$

[10] Our approach for excluding the non-asset holding income from the net factor income can be explained by the fact that net income flows such as transfers, remittances, and wages and salaries may not be negligible and carry the potential to overestimate net factor income if dividends and interests from bonds are smaller in relative terms. The drawback is that one may fail to capture the full extent of risk sharing. The imbalance between non-asset and asset-holding income flows is typical in well populated emerging markets where a portion of the population works in foreign countries to meet obligations in their home country. Studies based on OECD countries have been assuming thus far that these flows should offset each other and naturally have the same effects on risk sharing. We reconstruct this methodology by proposing a measure of income that is reflective of purely international asset holding earnings to capture risk sharing.

where GDPin is defined as GDP + factor income inflows. The structure of this equation documents that we only consider the income inflows coming from abroad instead of the net income flows.

In addition, we follow Mlitz and Zumer (1999) in modeling risk sharing(income smoothing) as a time-varying process for OECD countries and impose the following structure on the coefficient estimate of income smoothing, β_f as:

$$\beta_f = \beta_{f0} + \beta_{f1}\,\gamma_i, \tag{3}$$

where γ_i is the "interaction" variable that influences the amount of smoothing accrues to country i.

Sørensen, et. al (2007) and Balli and Sørensen (2007) extended Equation (3) by allowing β_f to change over time and to be explained by other factors, as follows

$$\beta_f \;=\; \beta_{f0} \;+\; \beta_{f1}\,(t \;-\; \bar{t}) \;+\; \beta_{f2}\,(X_{it} \;-\; \overline{X})\,, \tag{4}$$

where X_{it} is a variable that potentially may have an impact on factor income risk sharing. We subtract the mean of the "interaction variables" to leave the interpretation of β_{f0} as the average amount of income smoothing. As an empirical framework, we calculate the following equation:

$$\begin{aligned} \Delta \log \text{GDPin}_t^i - \Delta \log \text{GDP}_t^i \;\; &= \;\; \nu_{f,t} + \beta_{f0}\;\; \Delta \log \text{GDP}_t^i + \beta_{f1}\;\; \Delta \log \text{GDP}_t^i * (t \;-\; \bar{t}) \qquad (5) \\ &\quad + \beta_{f2}\;\; \Delta \log \text{GDP}_t^i * (X_{it} \;-\; \overline{X}) \;\; + \;\; \epsilon_{f,t}^i \;. \qquad (6) \end{aligned}$$

where GDPin is defined as GDP + factor income inflows.

4 Data and Data Analysis

We use a broad sample of high-income OECD countries to investigate the relationship between international portfolio allocation and income smoothing and test whether our innovation of

solely focusing on factor income inflow makes a difference to the existing literature.[11] We obtained a pair-wise volume of cross border equity holdings in US dollars from the International Monetary Fund's (IMF) Coordinated Portfolio Investment Surveys (CPIS) for the period 2001–2006. This survey data set is known to be reliable since the surveys were conducted using guidelines that are consistent in measuring bonds and equity holdings across countries.[12] Total market capitalization of equity markets is obtained from the World Development Indicators Database (WDI). To estimate the risk-sharing regressions, we gather national accounts data from OECD National Accounts–Main Aggregates (Volume I) and detailed tables (Volume II) that cover the period 1990–2006. We use the ISIC 1-digit classification of the production sectors from the United Nations Statistical Database for the same period to capture the extent of specialization in output.[13]

Home bias in portfolio allocation can be defined as the excessive investment in domestic assets over the optimal amount recommended by the international CAPM. However, the more a country specializes in production the more internationally diversified of a portfolio investors may require to hold in order to minimize risks. As Kalemli-Ozcan et al. (2003) show, higher output specialization translate into more idiosyncratic shocks across countries. Since we are particularly interested in the role that factor income flows may play in smoothing income, we construct three key variables to fully grasp the linkages between economic integration, output specialization, international portfolio diversification, and factor income flows across countries, namely, a diversification, home equity bias, and an output specialization indexes.

4.1 Variables

- **Diversification Index** Smoothing via factor income is not improved for the OECD members, although the volume of international asset holdings increased substantially. If we consider OECD members' euro share in foreign equity holdings , one can undoubtedly

[11] Data set include Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, Spain, Australia, Canada, Japan, Iceland Korea, New Zealand, Norway, Singapore, Sweden, Switzerland, UK, and US.

[12] Imbs (2004) unveils the shortcomings to CPIS but accepts the crude reality that there are no other data sources as alternative available.

[13] ISIC stands for International Standard Industrial Classification. It is a standard classification of productive economic activities.

claim that the more diversified euro equity portfolio a country has, the higher possibility it will diversify its foreign portfolio and have domestic GDP which is less correlated with GNP. We create the diversification index to the Euro area equity portfolio as follows:

$$\frac{1}{\sum_{j=1}^{n} |(\theta_{i,t}^{j} - \theta_{i,t}^{max})|} , \tag{7}$$

where θ_i^j is the ratio of equity holdings of OECD member i from the euro member j over total foreign equity holdings of country i. θ_i^{max} is the maximum ratio of foreign equity holding of country i from any euro member. The index gives larger weight to countries with highly diversified Euro equity portfolios, and smaller weight to those that hold equities from a limited number of Euro markets. Figure 1 displays in the lower panel the Euro share of total European Union members' foreign equity holdings while the upper panel shows the Euro share of rest of the OECD members' foreign equity holdings. It is evident that Euro investors, on average, exhibit a clear tendency towards investing a large share of their equity in the Euro Area, which we refer as the Euro equity bias, while non-Euro OECD investors' sentiment towards Euro equities are relatively constant over time.

Figure 1 about here

- **Home Equity Bias**. We define "home portfolio bias" as the excessive investment in domestic portfolio compared with the optimal amount of allocation of domestic portfolio that international CAPM model. The home equity bias index is calculated as:

$$HOMEBIAS_t^i = \frac{(1 - F_t^i)}{(1 - D_t^i)}. \tag{8}$$

where F_t^i is the foreign equity ratio in total equity portfolio of country i at time t. Total equity portfolio of country i is equal to stock market capitalization + foreign equity held - amount of country's equity held by foreigners. D_t^i is a ratio of stock market capitalization of country i to stock market capitalization of the world. Figure 2 contains the home bias levels of the countries from 2001 to 2006. We clearly observe gradual decrease in the

home equity bias which is consistent with the higher volume of foreign asset trading across borders.

- **Output Specialization**

  For OECD members in general, we follow Forbes and Chin's (2004) trade index to create the output specialization index, namely

$$\text{SPEC}_{i,t} = \sum_{j=1}^{n} |(\frac{\text{GDP}^i_{j,t}}{\text{GDP}^S_{j,t}} \frac{\text{GDP}^i_{j,t}}{\text{GDP}^i_t}) - \text{MAX}_{j,t}| \ , \tag{9}$$

  where GDP^i_j is output value of the country i for, GDP^S_j is the total value of output in entire OECD sample area for the sector j. MAX_j is the maximum value of the expression in parentheses for every sector for each country i. It is worth noting that the index is also made of a weighted product of two terms. The first term is the output of country i in industry j as a share of OECD's total output in that same industry. It controls for the impact of country i's output from a particular sector on the total product of that sector for the whole sample. The second term is the share of sector j in total output of country i. This term captures the relative importance of production in sector j for country i. All variables are measured in U.S. dollars. The j industries' classification originates from the 1-digit ISIC index. Our index produces higher values for countries that are industrially specialized and lower values for those that are not. We present in Figure 3 the pattern of output specialization for both European Monetary Union (EMU) and other OECD countries for the period 1990–2006. EMU members show an upward tendency in output specialization over time while the remaining OECD countries do not display such a trend. This finding lends support to Kalemli-Ozcan et al. (2003) that the EMU members encompass higher output specialization in comparison to other high income OECD countries because their economies are highly integrated.[14] A corollary of the linkages between output specialization and economic integration is the vulnerability of asymmetric shocks across the integrated regions.(Kalemli-Ozcan et al. 2001). Simply

[14]Doyle and Faust (2003) estimate the correlation between output growth of the U.S. and other high income OECD members. They find no significant increase in GDP correlations among that sample.

put, the more integrated an economy is with others, the more specialized output is, the more asymmetric shocks are likely to be a burden, the more internationally diversified of a portfolio of assets that country needs to smooth income and consumption. Kalemli-Ozcan et al. (2003)'s contribution substantiates the need for income insurance on production specialization in order to cope with resulting asymmetric shocks. They have found that country-level specialization in production has been increasing from 1990s onwards as a result of better risk sharing among EMU members. This explanation is consistent with the upward trend observed in Figure 3.[15]

Figure 3 about here

5 Empirical Findings

A strand of the literature contends that economic integration along with diversified portfolio holdings creates greater possibilities for income risk sharing. We investigate this issue by differentiating between net factor income and factor income inflows and clearly present interesting results:

1. Congruently with the literature, Figure 4 illustrates that the volume of international asset trading has indeed been increasing in the last decade, most likely resulting in higher volume of income flows to domestic economies.[16].Table 1 displays our findings from the factor income risk sharing regressions for the two different sub-groups using various sub-samples for the period 1970–2006. Net Factor income smoothes 9.5 percent of GDP shocks in EMU region whereas factor income inflows smooth 12 percent. We find, however, no statistically significant effects for the other OECD members.
   Figure 4 about here

2. When we display, as per Figure 5, the year-to-year income smoothing patterns based on estimated regression equations 2 and 3, we observe that both the net factor income and

[15]Imbs (2004), however, argues that the patterns of output specialization cannot have any sizable effect on the business cycle synchronization. He shows that countries that are financially integrated have more instead of less synchronized business cycles.

[16]In the upper panel of figure 4, for Ireland and Switzerland the graph has been truncated, since the foreign equity to GDP ratios in thouse countries is over 100 percent.

the income smoothing via factor income inflows encompass higher levels of risk sharing for EMU members after 1996. Again, we could not find a substantial improvement for the rest of the OECD members. Income smoothing via factor income inflows is even negative for the last four years of the sample, despite the increase in the volume of the international financial asset trading noted in Figure 4.

Figure 5 about here

The fundamental issue we examine is whether the path of factor income smoothing has been unsettled by the introduction of the Euro currency. As evident from Figure 5, factor income smoothing rose steeply just before the launch of the Euro in 1999 and remains high in the vicinity of 20 percent thereafter. Table 1 also shows that factor income smoothing has been statistically insignificant before 1999, with only one exception for Non-EU OECD countries in the 1970s.

The recent increase in factor income smoothing is consistent with the large decline in home bias in asset holdings documented in Sørensen, Wu, Yosha, and Zhu (2007). Also, there seems to be a consensus in the literature that foreign asset holdings must be very large in order to produce significant smoothing or for risk sharing to be substantial. To that effect, we supply in Figure 1 the foreign equity holdings and in Figure 4 the foreign equity to GDP ratio for our sample. There might be some debate as to whether the former exhibits a clear upward trend but no such doubts can be cast on the latter. Foreign equity holdings have been increasing sharply in the last few years. Surprisingly, we do not observe the accompanying income smoothing found in the literature for Non-EU OECD countries

Our findings can be substantiated in the following terms. Let's assume that all capital in a country is owned by foreigners and residents of that country own foreign assets in the same amount.[17] Second, we further assume that one third of GDP accrues to capital. Therefore, one would expect 33 percent of output shocks to be smoothed by factor income. As an illustration, consider how our measure works in a 1-period case where GDP in a country starts at GDP_0 and $\text{GDP}_1 = 1.1 * \text{GDP}_0$. If world per capita GDP in both periods is fixed

[17]The capital-output ratio is often assumed to be around three or so, roughly, this would be a case where the level of gross foreign asset holdings is three times GDP.

at GDP_0 then $\text{GNP}_1 = 0.33 * \text{GDP}_0 + 0.66 * \text{GDP}_1 = \text{GDP}_0 + 0.66 * (\text{GDP}_1 - \text{GDP}_0)$. We have $\Delta \log \text{GNP}_1 \approx 0.66 * \Delta \log \text{GDP}_1$ which show that 33 percent of the output shock is smoothed by factor income flowing to other countries in a situation where all capital is owned by foreigners and foreign output is uncorrelated with domestic output.

Intuitively, under what circumstances will foreign factor income smooth GNP? When the nation's output increases or decreases, the factor income received from abroad might or might not move synchronously with domestic output fluctuations, not to mention by the same magnitude. In reality, many other patterns can occur and it is possible for factor income to even dis-smooth.[18] Table 1 shows that our innovation to focus on factor income inflows instead of net factor income flows is useful. We report higher levels of income smoothing for the EU members starting from 1990s onward.

5.1 Sensitivity Analysis

We carry out a sensitivity analysis to determine whether the difference in the methodology stands on firm grounds. We drop Ireland and Netherlands, which have the lowest home equity bias levels among euro members from the sample.[19] The results are reported in Table 2 with 3 panels. Panel A shows the results of the truncated sample defined above. It can be gleaned that the coefficient of smoothing via factor income inflows, β_+, decreases considerably in the last two sub-periods whereas the net factor income smoothing, β_f, does not change that much, though we expected it to decrease also. The coefficients in the Panel A indicates that income smoothing is much higher if we consider Ireland and the Netherlands which are the most "open" countries across the Euro area.

In panel B of Table 2, we drop Greece, the member with the highest home equity bias level among euro members, from the regression equation instead. Expectedly, the income smoothing via factor income inflows increases from 12 % to 17 % and are statistically significant for the last two sub-periods, whereas the former smoothing model does not have that sensitivity, even

[18] A more likely situation for OECD countries may be one where a country has a large net debt position and the world interest rate falls, to take a concrete example, leading to lower debt payments. If creditor countries happen to grow fast during such a period while debtor countries grow slowly, debt holdings could contribute negatively to measured risk sharing.

[19] Since it has negative level, Ireland's home equity bias levels has not been reported in Figure 6.

it reacts in the opposite direction after we drop Greece. In Panel C of Table 3, we performed a similar test for non-EU OECD members, by dropping Switzerland, having the lowest home equity bias level among OECD-EU members, income smoothing through our methodology decreases from 3 % to 2 % whereas regressions based up on the net income flows does not show that level of sensitivity after dropping Switzerland.

This simulation demonstrates that a clear relationship between foreign equity holdings and income smoothing via net factor inflows exists but the same cannot be said for net factor income inflows. In light of these facts, and considering the genuine relationship between the foreign asset holdings and income smoothing, we surmise that our approach of using factor income inflows is superior to the existing net factor income approach in the literature to measure income smoothing via capital markets across countries.

5.2 Income Smoothing, Home Biasness, Diversification, and Specialization

To shed light on the underlying factors explaining income smoothing, we estimate Equation 6, which incorporates the diversification, home equity, and output specialization indexes constructed earlier. The regression results are shown in Table 3 for non-EU OECD members.[20] We notice that higher volume of equity holdings is positively correlated to income smoothing, despite when a country mainly allocates its portfolio domestically, higher levels of home bias emerges, and as a result smoothing via factor income decreases. The diversification index coefficient is found to be positive and statistically significant in the multivariate but not in the bivariate regression. This supports our view that diversification of the portfolio within Euro equity markets enhance income smoothing. The importance of euro equity holdings is tested with the variable Euro bias. Distinctively, we investigate whether holding higher volume of euro equity can have a positive effect on income smoothing. The coefficient is found to be positive and significant suggesting that the higher volume of equity holdings gives rise to higher income risk sharing. Not surprisingly, for the bivariate case we find a strong relationship between the specialization index and income smoothing, even though in the multivariate case

[20]We consider 14 EU countries of which 11 are EMU members (excluding Luxembourg) and three are non EMU members but EU members , namely Denmark, Sweden and the UK.

the effect is not statistically significant.

Table 4 reports the results based on Equation 5 for the EU sample for the period 2002–2006.[21] We find that the specialization and diversification indexes have considerable power or influence to explain income smoothing in EMU region. Moreover, higher volume of equity portfolio holdings has positive effects on income smoothing. Lastly, in order to ensure comparability with the results in Table 4, we performed the same regression analysis for the entire OECD sample and present the results in Table 5. We did not find any significant differences between the two tables. Higher level of portfolio holding increases the portfolio allocation across the Euro region and the diversification of the portfolio bestows higher income smoothing. We also find, for the broader sample, that output specialization is a key contributor to income smoothing among all OECD members.

This paper has made a practical contribution to the literature in explaining the factors underlying risk sharing. However, we have only considered the equity market and find that it is the most significant factor. Also, there are reasons to believe that international debt securities' trading does not have such power. Appendix Figure 1 and 2 contain the 10-year government bond yield rate for all OECD countries. It shows that the yield differentials have decreased considerably over time. This is consistent with recent studies by Pagano (2004), Codogno et al.(2003), and Balli (2008). These authors find that there is a high correlation between European bond markets which restrains risk sharing.[22]

6 Conclusion

In this paper, we have made two contributions to the literature. First, we have constructed a new and better measure of income to capture income smoothing. Second, using an extended data set and panel regression techniques, we present new empirical evidence on the linkages between international asset trading and income smoothing. We have used factor income inflows

[21] In the CPIS survey, the data for year 2001 do not seem to be very reliable. For some countries, the survey output in total is higher than what IFS reports as foreign asset holdings of those countries. We exclude that year accordingly.

[22] Adjaout et al.(2002) and Balli (2008) concluded that since government bond yield differentials across euro region are in very small amount and corporate bond returns are highly correlated, euro bond bias, which is very high across OECD countries, does not create ample opportunity for risk sharing.

instead of net factor income that is common in the literature and found results similar to Sørensen et al (2007). There is a strong correlation between risk sharing and equity portfolio home bias of EU members. However, we did not find this relationship to be statistically significant for the remaining OECD members. We also found that specialization in output plays a significant role in income smoothing. The increased level of economic integration witnessed in the Euro area as a result of the monetary union fosters output specialization across EU members and leads to asymmetric output fluctuations. Cross-border financial assets' trading within the Euro area serves as a shock absorber as factor income flows to smooth domestic consumption and income. Our finding confirms Kalemli-Ozcan et al.'s (2003) that financial and economic integration across regions enhances specialization in production, thereby resulting in well-known benefits.

Overall, although we have observed the volume of international asset holding has increased for non-EU OECD members, we could not find the accompanying higher income smoothing. When we aggregate the data for all OECD members of our sample, we did not observe any gains in terms of income smoothing through international asset trading, despite the decrease in home equity bias our empirical study has reported for the last decade. More precisely, the decrease in home bias itself has not brought about (at least enough) positive impacts on income smoothing. This is the case for the Euro equity markets. Even when European investors diversify their equity portfolios equally across the Euro area, they reduce their exposure to income risk to the lowest. This finding aligns with Kalemli-Ozcan et al. (2001, 2003) and Sørensen et al. (2007) on the debate over the linkages between economic integration and asymmetric shocks. Our paper unambiguously shows that integrated EU countries experience asymmetric shocks and it is through equity market channels that we observe that such asymmetry is absorbed via factor income flows.

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Table 1: **Income Smoothing (percent) from International Factor Income.**

	Panel A: OECD-EU			
	1971–1980	1981–1990	1991–2000	2001–2006
β_{f+}	–1.64	–0.52	2.32	2.96
	(0.95)	(0.94)	(1.47)	(2.66)
β_f	1.41	–2.95	–1.98	2.26
	(0.62)	(1.42)	(1.29)	(2.93)
	Panel B: EMU			
	1971–1980	1981–1990	1991–2000	2001–2006
β_{f+}	0.43	–3.1	6.25	12.13
	(0.91)	(1.52)	(2.06)	(6.06)
β_f	-0.98	–2.01	4.61	9.47
	(0.75)	(1.93)	(2.34)	(2.52)

*Notes.*OECD–EU: Australia, Canada, Japan, Korea Republic, New Zealand, Norway, Switzerland, and US. EMU: Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, and Spain. We exclude Luxembourg, since it is an outlier with its position. Percentages of shocks absorbed at each level of smoothing. Standard errors in brackets. The table shows, for incoming factor income, the coefficient β_{f+}, the GLS estimate of the slope in the regression of $\Delta \log(\text{GDP+ international factor income received})^i$- $\Delta \log \text{GDP}^i$ on $\Delta \log \text{GDP}^i$. The coefficient β_f, is the GLS estimate of the slope in the regression of $\Delta \log \text{GDP}^i - \Delta \log \text{GNP}^i$ on $\Delta \log \text{GDP}^i$.

Table 2: **Income Smoothing (percent) from International Factor Income.**

Panel A: EMU without Ireland and Netherlands

	1971–1980	1981–1990	1991–2000	2001–2006
β_{f+}	1.14	–4.04	0.57	4.87
	(0.81)	(1.81)	(2.23)	(5.82)
β_f	–1.23	–3.32	–0.3	8.48
	(0.69)	(1.75)	(2.57)	(2.63)

Panel B: EMU without Greece

	1971–1980	1981–1990	1991–2000	2001–2006
β_{f+}	1.34	–2.03	7.31	17.06
	(0.86)	(1.77)	(2.06)	(6.86)
β_f	–1.64	–3.13	4.49	5.33
	(0.77)	(1.93)	(2.41)	(3.17)

Panel C: OECD-EU without Switzerland

	1971–1980	1981–1990	1991–2000	2001–2006
β_{f+}	–2.75	–3.61	1.16	1.63
	(0.88)	(1.42)	(1.79)	(1.94)
β_f	0.83	–3.37	–3.13	2.11
	(0.61)	(0.92)	(1.43)	(3.46)

*Notes.*OECD–EU: Australia, Canada, Japan, Korea Republic, New Zealand, Norway, Switzerland, and US. EMU: Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, and Spain. We exclude Luxembourg, since it is an outlier with its position. Percentages of shocks absorbed at each level of smoothing. Standard errors in brackets. The table shows, for incoming factor income, the coefficient β_{f+}, the GLS estimate of the slope in the regression of $\Delta \log(\text{GDP}+ \text{ international factor income received})^i$-$\Delta \log \text{GDP}^i$ on $\Delta \log \text{GDP}^i$. The coefficient β_f, is the GLS estimate of the slope in the regression of $\Delta \log \text{GDP}^i - \Delta \log \text{GNP}^i$ on $\Delta \log \text{GDP}^i$.

Table 3: **Income Risk Sharing and Foreign portfolio Diversification for OECD-EMU(excluding EU states) for Years 2001–2006.**

	(1)	(2)	(3)	(4)	(5)	
Bo	−11.60	10.54	−5.22	5.24	−16.08	–86.07
	(6.03)	(10.52)	(11.94)	(7.02)	(10.92)	(56.49)
SPECIALIZATION	28.36					12.07
	(14.69)					(13.01)
DIVERSIFICATION		7.27				19.81
		(15.80)				(10.79)
EUROBIAS			31.38			58.25
			(14.66)			(27.84)
HOMEBIAS				-13.25		–15.58
				(13.61)		(12.03)
EQUITY/GDP					45.72	50.53
					(24.50)	(24.1)

Notes: OECD–EU: Australia, Canada, Japan, Korea Republic, New Zealand, Norway, Switzerland, and US. Heteroscedasticity consistent standard errors are given in parenthesis. The Panel data regressions for income smoothing is in the form of:
$\Delta \log \text{GDPin}_t^i - \Delta \log \text{GDP}_t^i = B_t * \Delta \log \text{GDP}_t^i + \epsilon_t^i$,
where $B_t = B_o + B_i * (X_t - \overline{X})$. X contains the variables that potentially impact on factor income smoothing. B_o is the average amount of income smoothing. SPECIALIZATION is a an index, created in order to measure how much country i specialized in output production. How we construct the index is explained in detailed in the text. DIVERSIFICATION is a particular index created to measure how much the country i diversified its "euro" equity portfolio. The detailed formula is in the text. EUROBIAS is the share of each country's euro equity portfolio in their total foreign portfolio. Similarly, HOMEBIAS is the level of the home equity bias of each member. EQUITY/GDP is the total ratio of total foreign portfolio held by the investors in country i to the gross domestic product of that country.

Table 4: **Income Risk Sharing and Foreign portfolio Diversification for EMU for Years 2001–2006.**

	(1)	(2)	(3)	(4)	(5)	
Bo	−16.11	2.79	–2.78	5.63	−14.13	−49.74
	(11.71)	(8.04)	(18.11)	(18.38)	(8.16)	(77.46)
SPECIALIZATION	34.85					80.79
	(20.74)					(18.39)
DIVERSIFICATION		44.80				56.50
		(25.58)				(26.83)
EUROBIAS			33.02			46.02
			(36.30)			(33.29)
HOMEBIAS				-18.83		–28.48
				(20.75)		(33.18)
EQUITY/GDP					24.35	94.13
					(13.25)	(18.33)

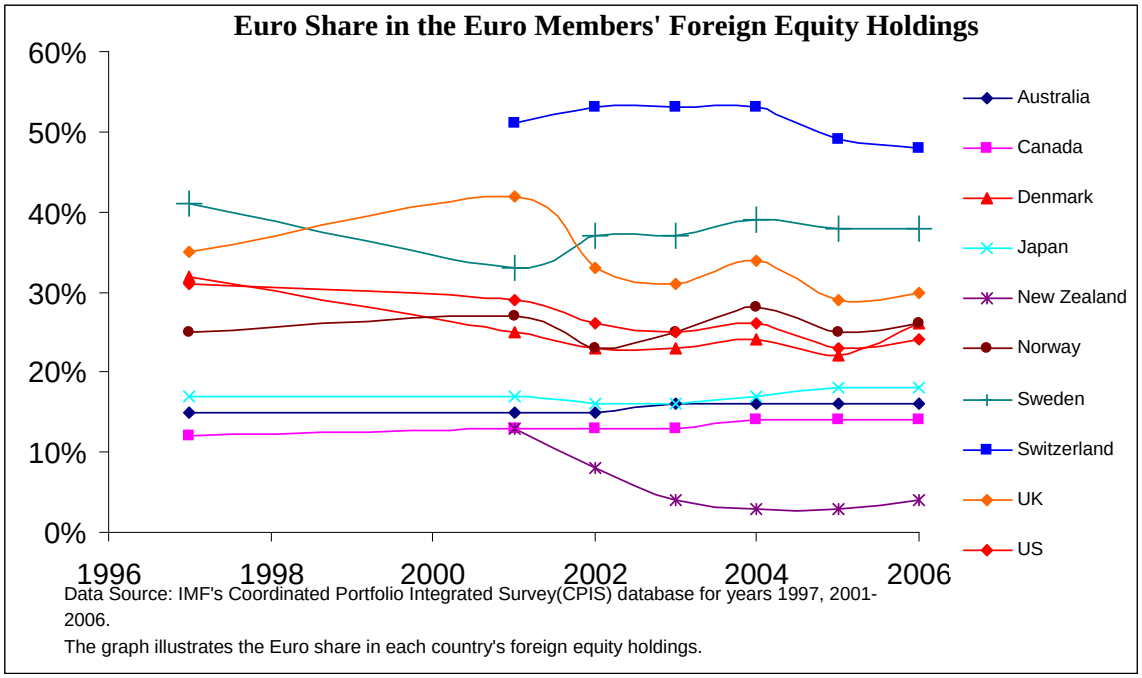
Notes: EMU: Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, and Spain. We exclude Luxembourg, since it is an outlier with its financial and geographic position. Heteroscedasticity consistent standard errors are given in parenthesis. The Panel data regressions for income smoothing is in the form of:
$\Delta \log \text{GDPin}_t^i - \Delta \log \text{GDP}_t^i = B_t * \Delta \log \text{GDP}_t^i + \epsilon_t^i$,
where $B_t = B_o + B_i * (X_t - \overline{X})$. X contains the variables that potentially impact on factor income smoothing. B_o is the average amount of income smoothing. SPECIALIZATION is a an index, created in order to measure how much country i specialized in output production. How we construct the index is explained in detailed in the text. DIVERSIFICATION is a particular index created to measure how much the country i diversified its "euro" equity portfolio. The detailed formula is in the text. EUROBIAS is the share of each country's euro equity portfolio in their total foreign portfolio. Similarly, HOMEBIAS is the level of the home equity bias of each member. EQUITY/GDP is the total ratio of total foreign portfolio held by the investors in country i to the gross domestic product of that country.

Table 5: **Income Risk Sharing and Foreign portfolio Diversification for OECD Members for Years 2001–2006.**

	(1)	(2)	(3)	(4)	(5)	
Bo	−9.71	4.31	–3.73	13.36	−8.90	−16.63
	(4.35)	(5.02)	(6.17)	(6.88)	(4.39)	(4.21)
SPECIALIZATION$_i$	23.73					30.23
	(10.25)					(9.21)
DIVERSIFICATION$_i$		19.33				28.66
		(9.10)				(13.21)
EUROBIAS$_i$			–9.14			14.01
			(15.88)			(15.55)
HOMEBIAS$_i$				–21.67		–24.75
				(8.65)		(15.4)
EQUITY/GDP$_i$					32.81	41.87
					(9.55)	(13.17)

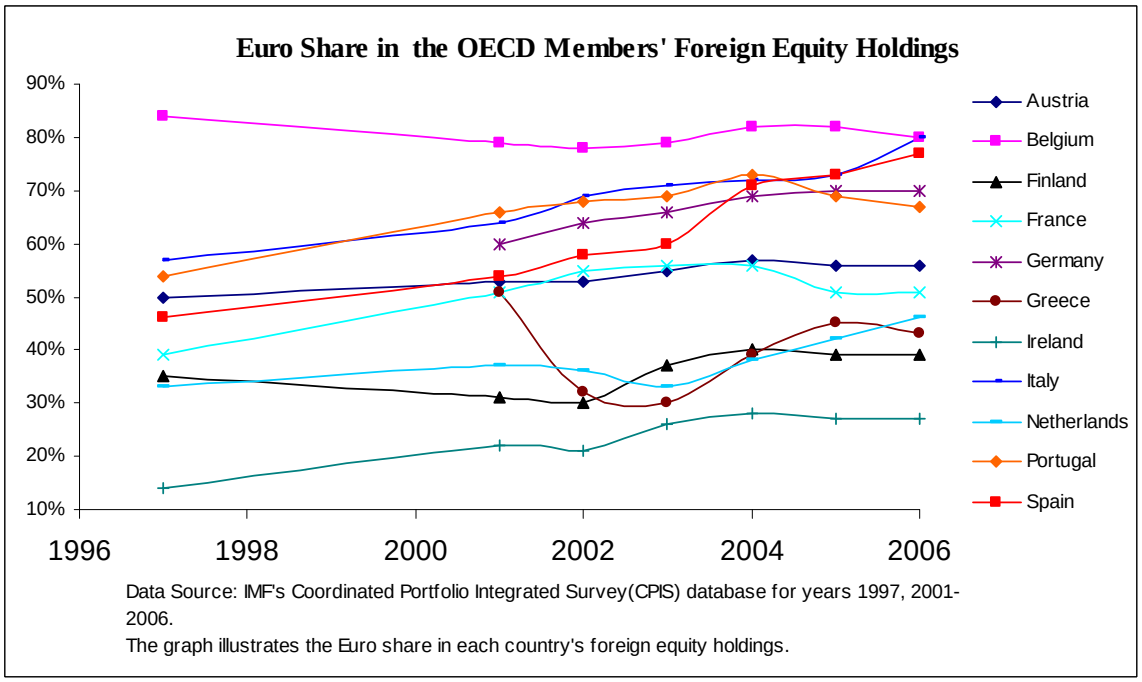
Notes: OECD: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany,Greece,Japan, Ireland, Italy, Korea,Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, UK, and US. Heteroscedasticity consistent t statistics are given in parenthesis. Heteroscedasticity consistent standard errors are given in parenthesis. The Panel data regressions for income smoothing is in the form of:
$\Delta \log \text{GDPin}_t^i - \Delta \log \text{GDP}_t^i = B_t * \Delta \log \text{GDP}_t^i + \epsilon_t^i$,
where $B_t = B_o + B_i * (X_t - \overline{X})$. X contains the variables that potentially impact on factor income smoothing. B_o is the average amount of income smoothing. SPECIALIZATION is a an index, created in order to measure how much country i specialized in output production. How we construct the index is explained in detailed in the text. DIVERSIFICATION is a particular index created to measure how much the country i diversified its "euro" equity portfolio. The detailed formula is in the text. EUROBIAS is the share of each country's euro equity portfolio in their total foreign portfolio. Similarly, HOMEBIAS is the level of the home equity bias of each member. EQUITY/GDP is the total ratio of total foreign portfolio held by the investors in country i to the gross domestic product of that country.

Figure1



Data Source: IMF's Coordinated Portfolio Integrated Survey(CPIS) database for years 1997, 2001-2006.

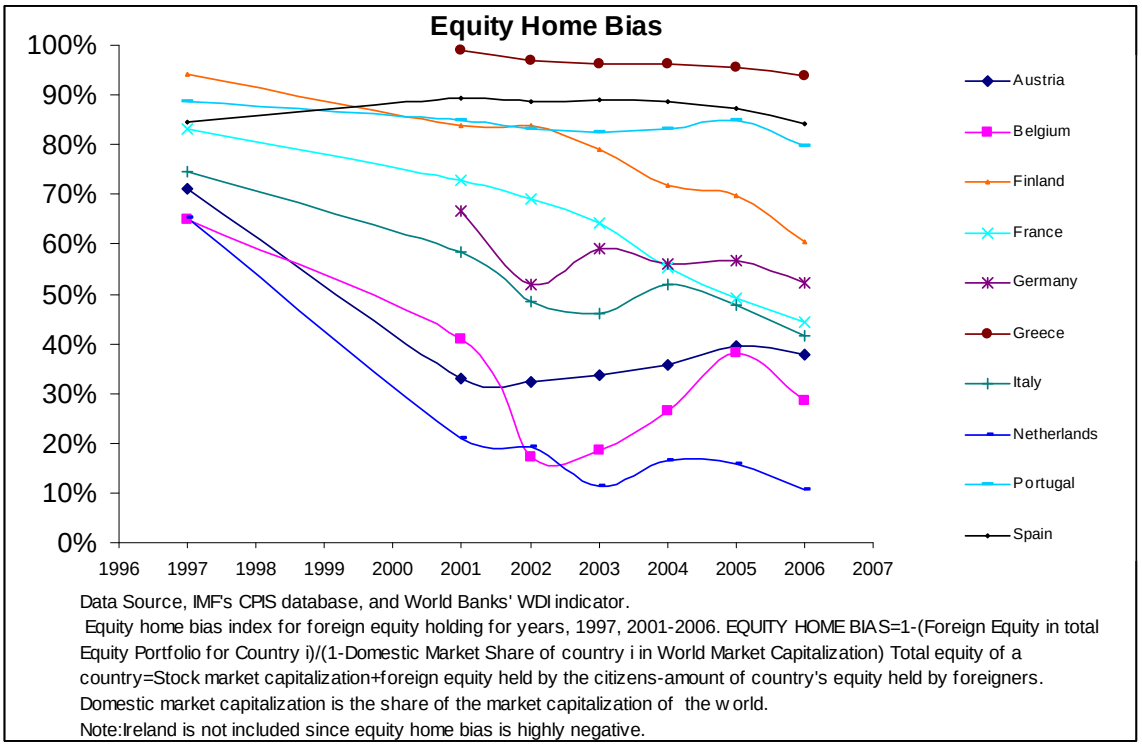
The graph illustrates the Euro share in each country's foreign equity holdings.



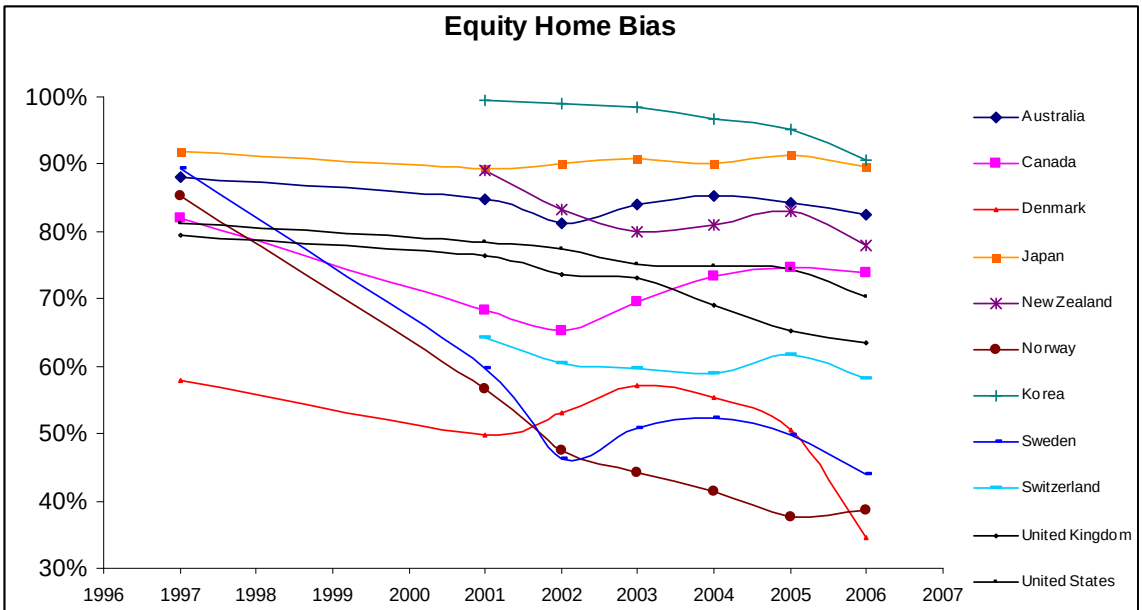
Data Source: IMF's Coordinated Portfolio Integrated Survey(CPIS) database for years 1997, 2001-2006.

The graph illustrates the Euro share in each country's foreign equity holdings.

Figure 2

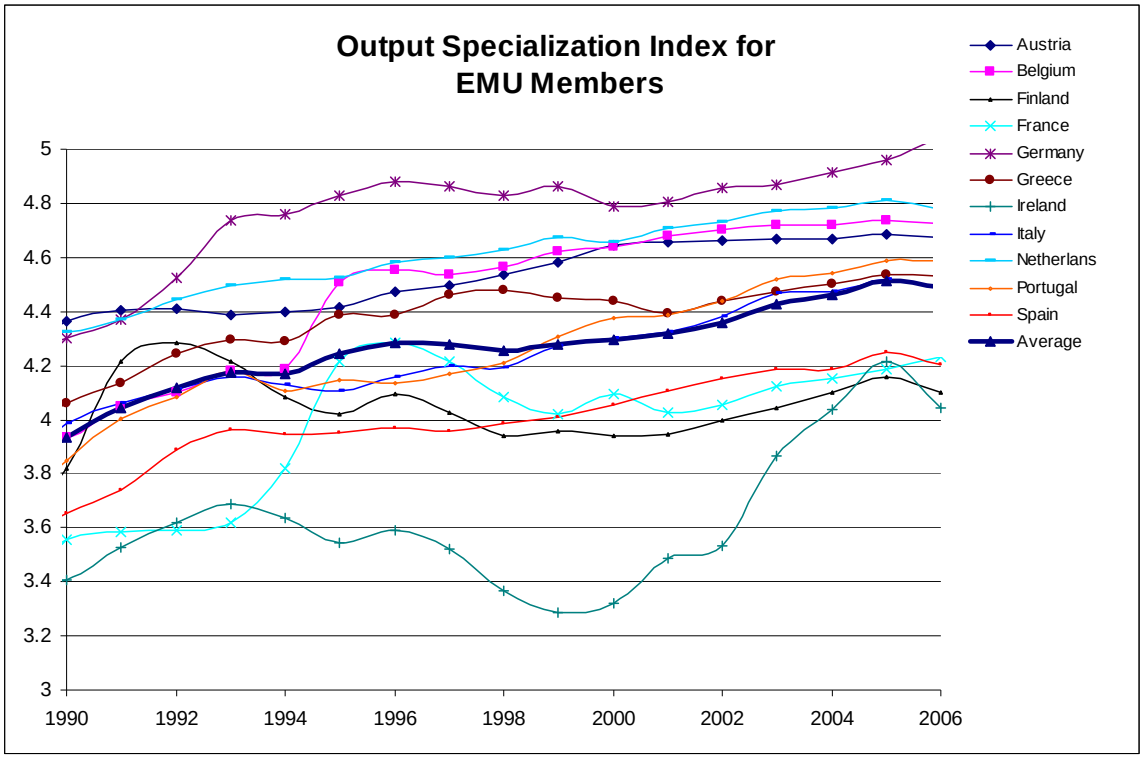


Data Source, IMF's CPIS database, and World Banks' WDI indicator.
Equity home bias index for foreign equity holding for years, 1997, 2001-2006. EQUITY HOME BIAS=1-(Foreign Equity in total Equity Portfolio for Country i)/(1-Domestic Market Share of country i in World Market Capitalization) Total equity of a country=Stock market capitalization+foreign equity held by the citizens-amount of country's equity held by foreigners. Domestic market capitalization is the share of the market capitalization of the world.
Note:Ireland is not included since equity home bias is highly negative.



Data Source, IMF's CPIS database, and World Banks' WDI indicator.
Equity home bias index for foreign equity holding for years, 1997, 2001-2006. EQUITY HOME BIAS=1-(Foreign Equity in total Equity Portfolio for Country i)/(1-Domestic Market Share of country i in World Market Capitalization) Total equity of a country=Stock market capitalization+foreign equity held by the citizens-amount of country's equity held by foreigners. Domestic market capitalization is the share of the market capitalization of the world.

Figure 3


Output Specialization Index for EMU Members
Austria
Belgium
Finland
France
Germany
Greece
Ireland
Italy
Netherlans
Portugal
Spain
Average
5
4.8
4.6
4.4
4.2
4
3.8
3.6
3.4
3.2
3
1990
1992
1994
1996
1998
2000
2002
2004
2006

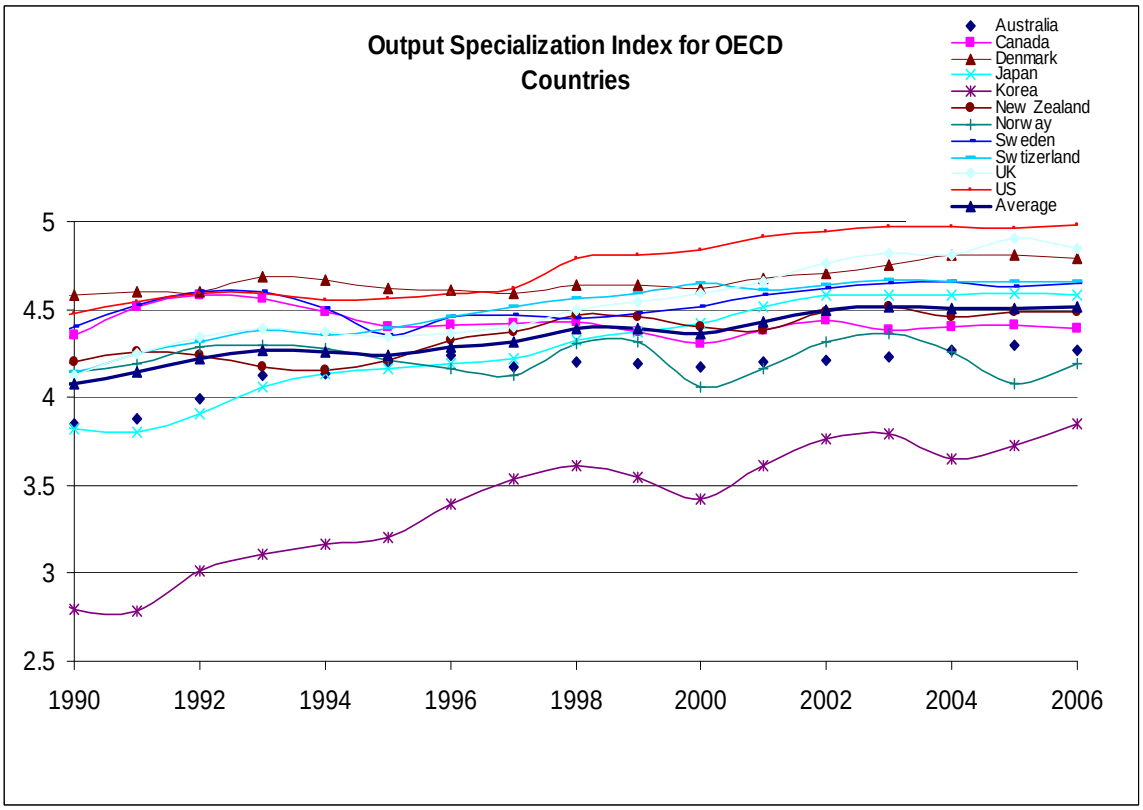
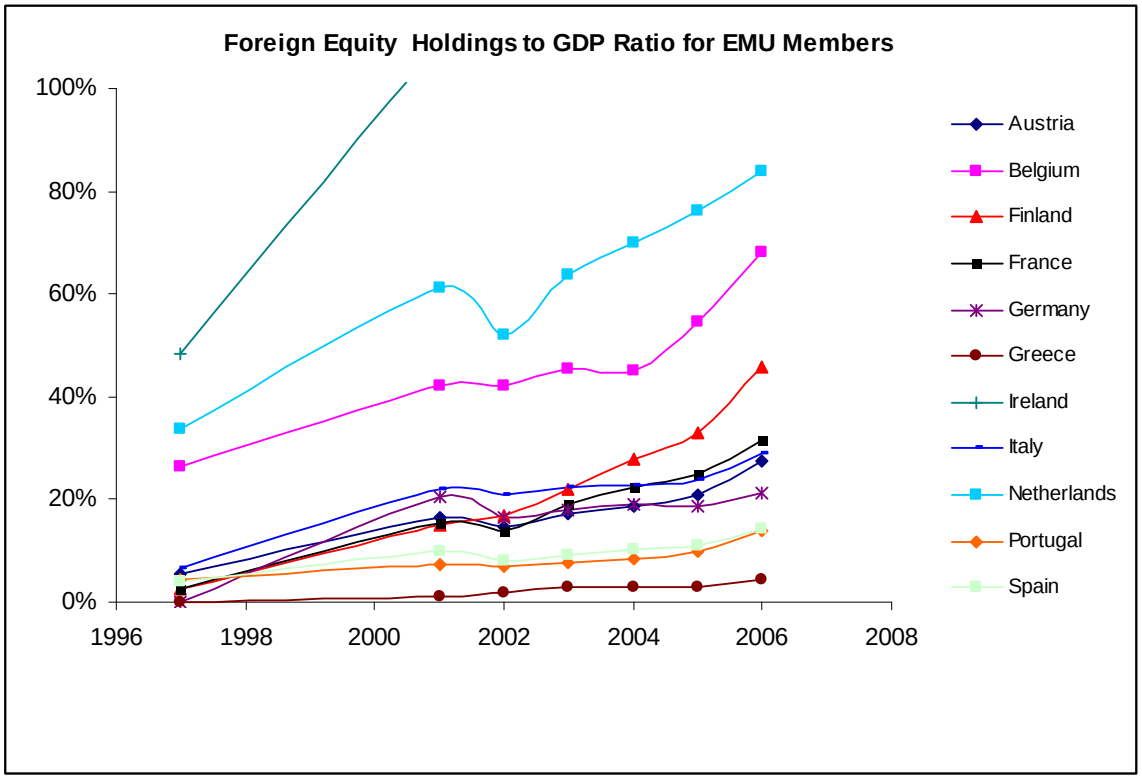

Output Specialization Index for OECD Countries
Australia
Canada
Denmark
Japan
Korea
New Zealand
Norway
Sweden
Switzerland
UK
US
Average
5
4.5
4
3.5
3
2.5
1990
1992
1994
1996
1998
2000
2002
2004
2006

Figure 4


Foreign Equity Holdings to GDP Ratio for EMU Members
100%
80%
60%
40%
20%
0%
1996
1998
2000
2002
2004
2006
2008
Austria
Belgium
Finland
France
Germany
Greece
Ireland
Italy
Netherlands
Portugal
Spain

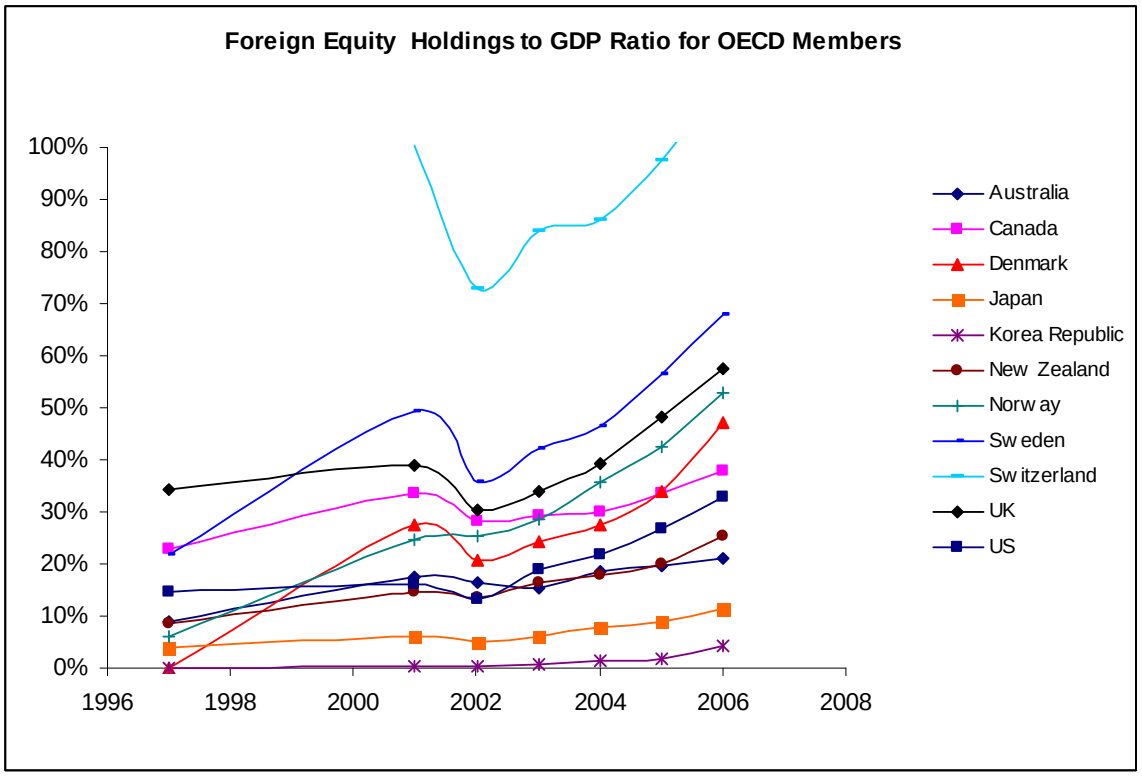
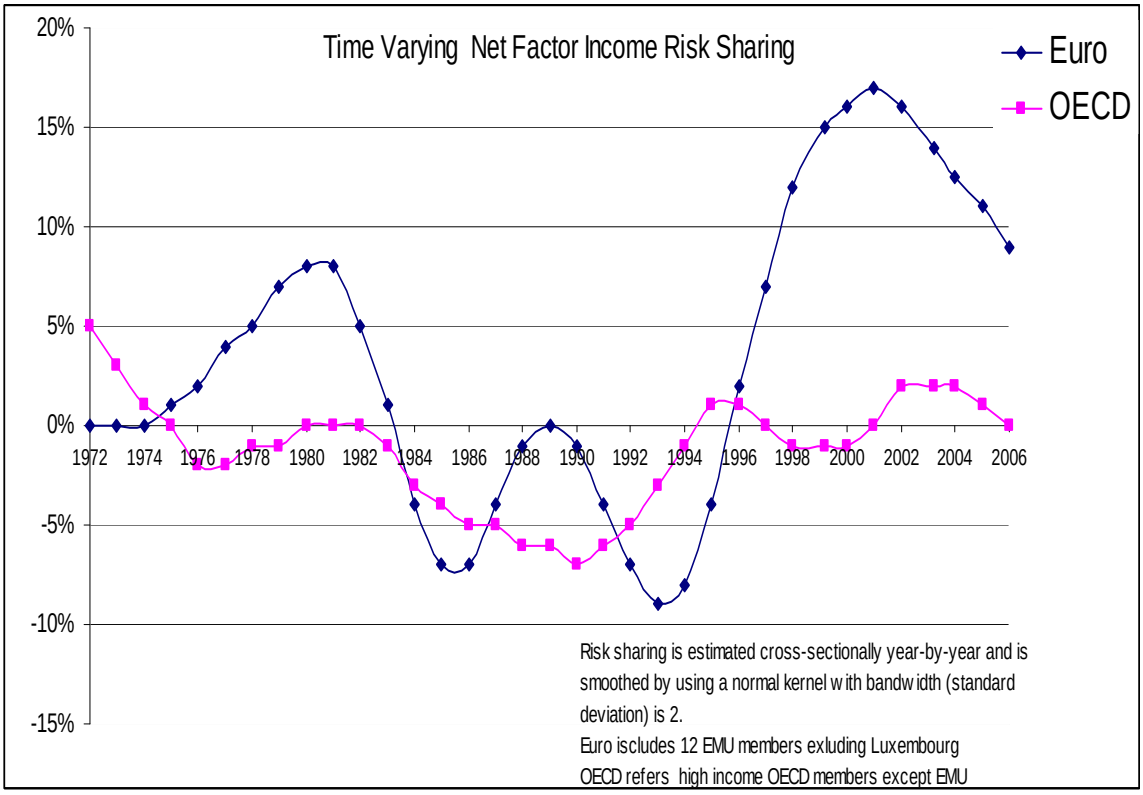

Foreign Equity Holdings to GDP Ratio for OECD Members
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
1996
1998
2000
2002
2004
2006
2008
Australia
Canada
Denmark
Japan
Korea Republic
New Zealand
Norway
Sweden
Switzerland
UK
US

Figure 5


Time Varying Net Factor Income Risk Sharing
Euro
OECD
20%
15%
10%
5%
0%
-5%
-10%
-15%
1972 1974 1976 1978 1980 1982 1984 1986 1988 1990 1992 1994 1996 1998 2000 2002 2004 2006
Risk sharing is estimated cross-sectionally year-by-year and is smoothed by using a normal kernel with bandwidth (standard deviation) is 2.
Euro iscludes 12 EMU members exluding Luxembourg
OECD refers high income OECD members except EMU

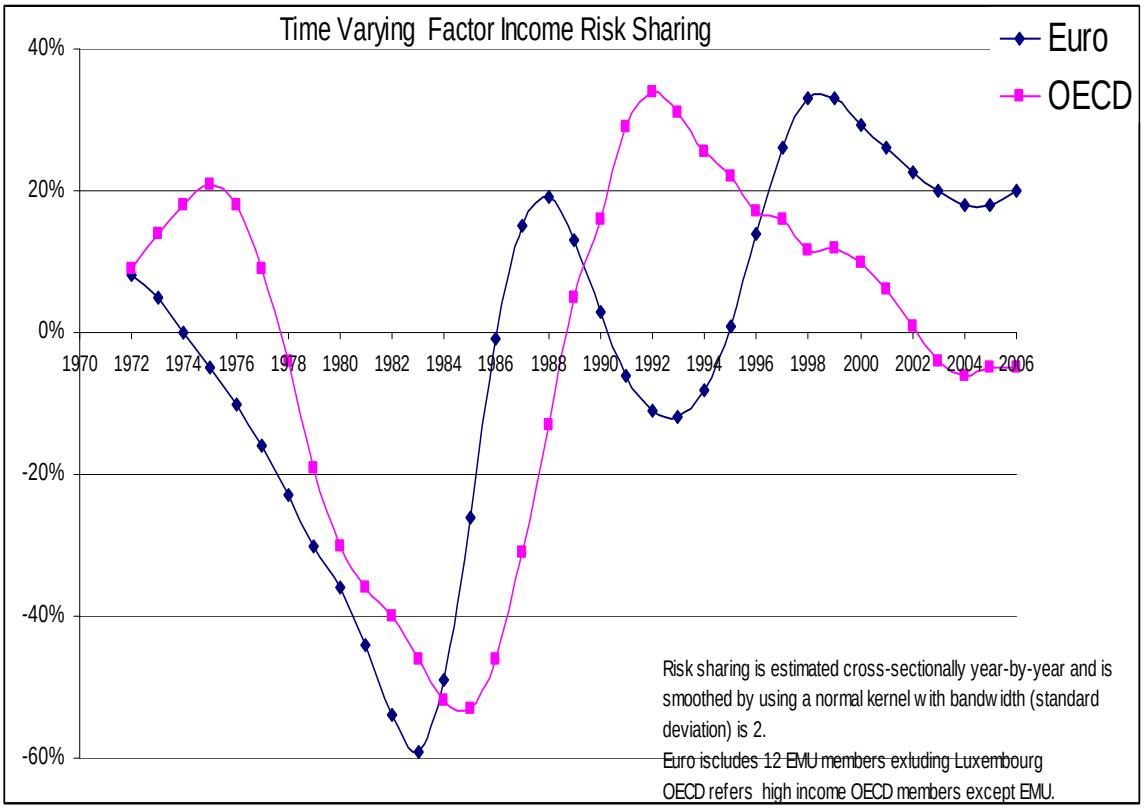
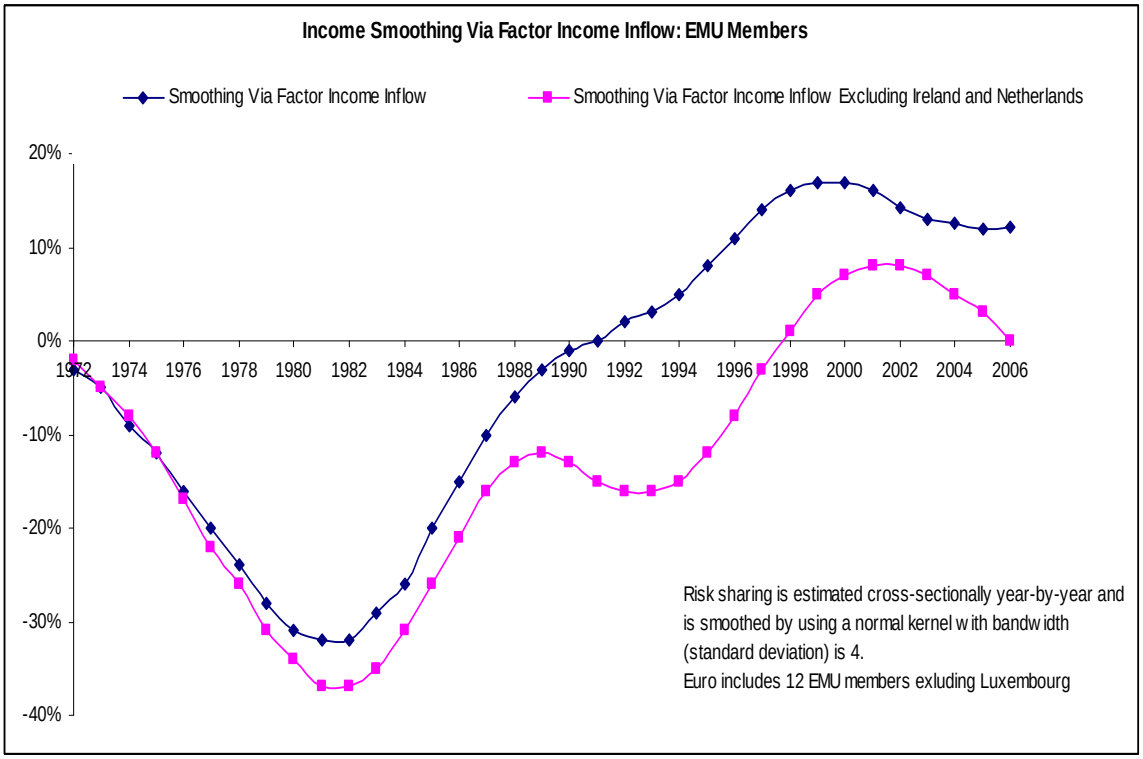
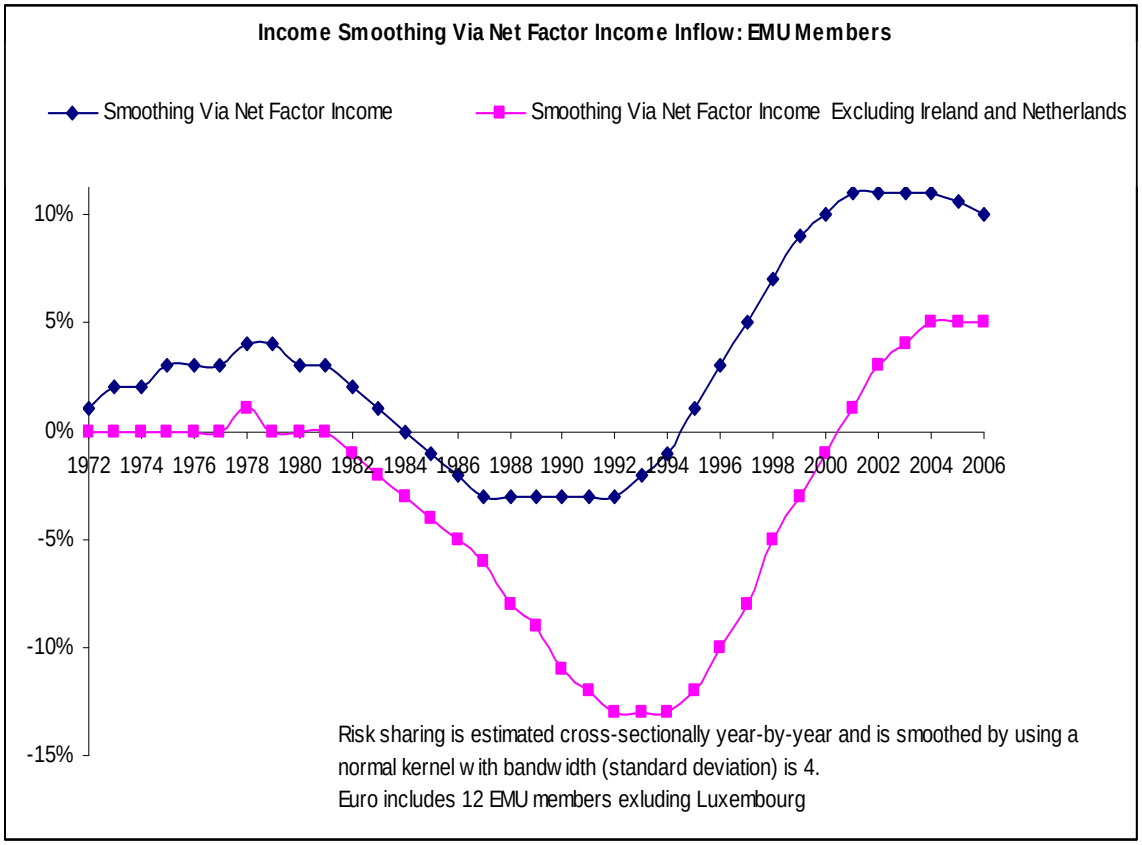
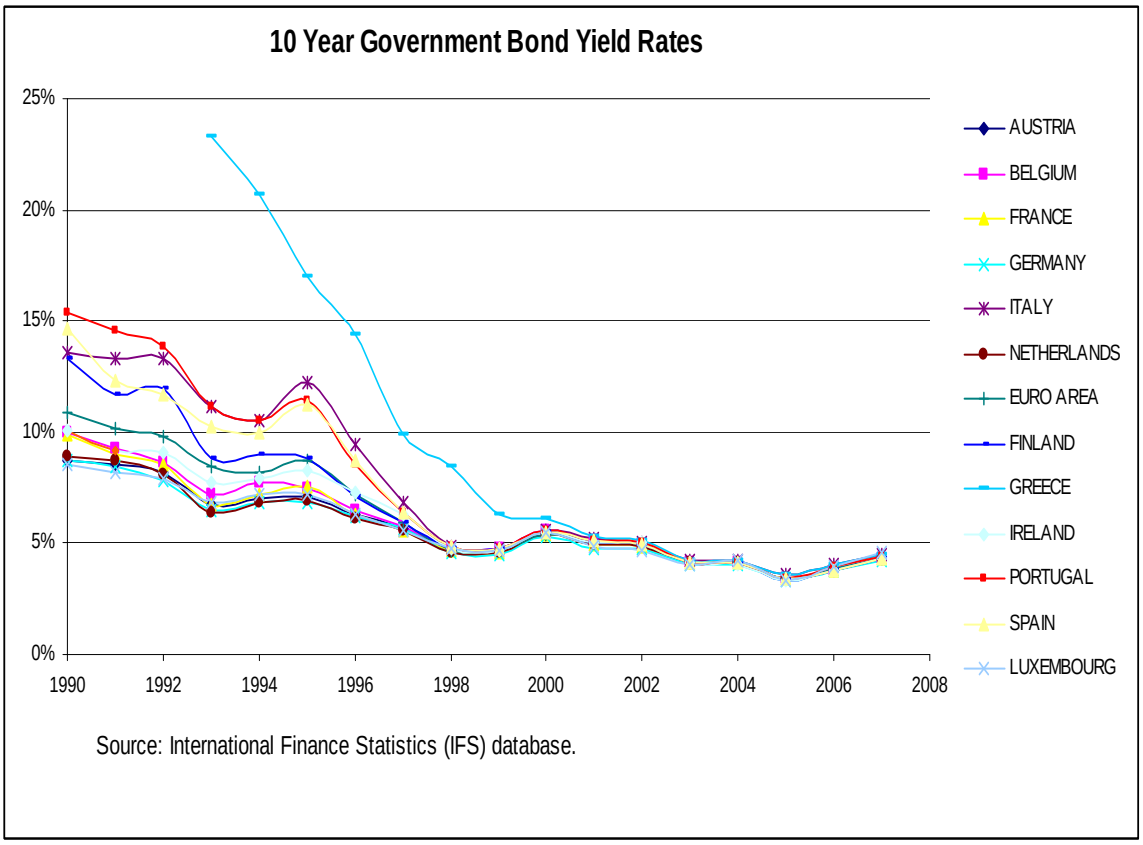

Time Varying Factor Income Risk Sharing
Euro
OECD
40%
20%
0%
-20%
-40%
-60%
1970 1972 1974 1976 1978 1980 1982 1984 1986 1988 1990 1992 1994 1996 1998 2000 2002 2004 2006
Risk sharing is estimated cross-sectionally year-by-year and is smoothed by using a normal kernel with bandwidth (standard deviation) is 2.
Euro iscludes 12 EMU members exluding Luxembourg
OECD refers high income OECD members except EMU.

Figure 6

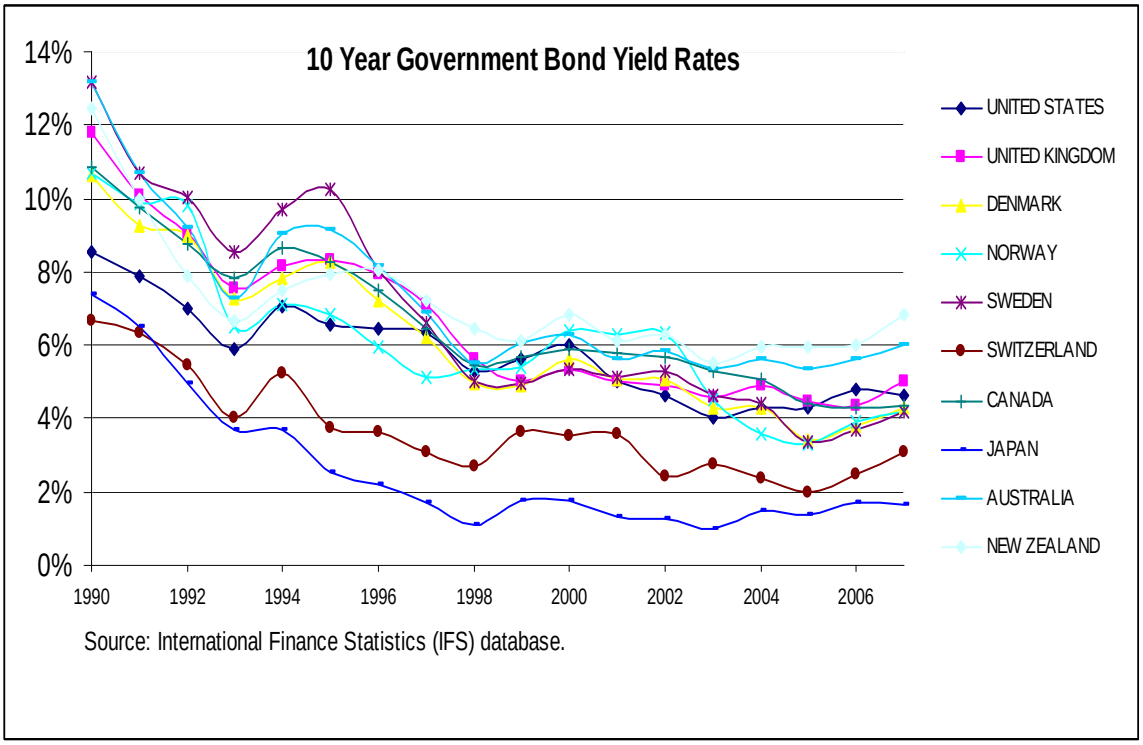

Income Smoothing Via Factor Income Inflow: EMU Members
Smoothing Via Factor Income Inflow
Smoothing Via Factor Income Inflow Excluding Ireland and Netherlands
20%
10%
0%
-10%
-20%
-30%
-40%
1972 1974 1976 1978 1980 1982 1984 1986 1988 1990 1992 1994 1996 1998 2000 2002 2004 2006
Risk sharing is estimated cross-sectionally year-by-year and is smoothed by using a normal kernel with bandwidth (standard deviation) is 4.
Euro includes 12 EMU members exluding Luxembourg


Income Smoothing Via Net Factor Income Inflow: EMU Members
Smoothing Via Net Factor Income
Smoothing Via Net Factor Income Excluding Ireland and Netherlands
10%
5%
0%
-5%
-10%
-15%
1972 1974 1976 1978 1980 1982 1984 1986 1988 1990 1992 1994 1996 1998 2000 2002 2004 2006
Risk sharing is estimated cross-sectionally year-by-year and is smoothed by using a normal kernel with bandwidth (standard deviation) is 4.
Euro includes 12 EMU members exluding Luxembourg

Appendix



Source: International Finance Statistics (IFS) database.



Source: International Finance Statistics (IFS) database.